Systems Engineering and Test in a Joint Environment

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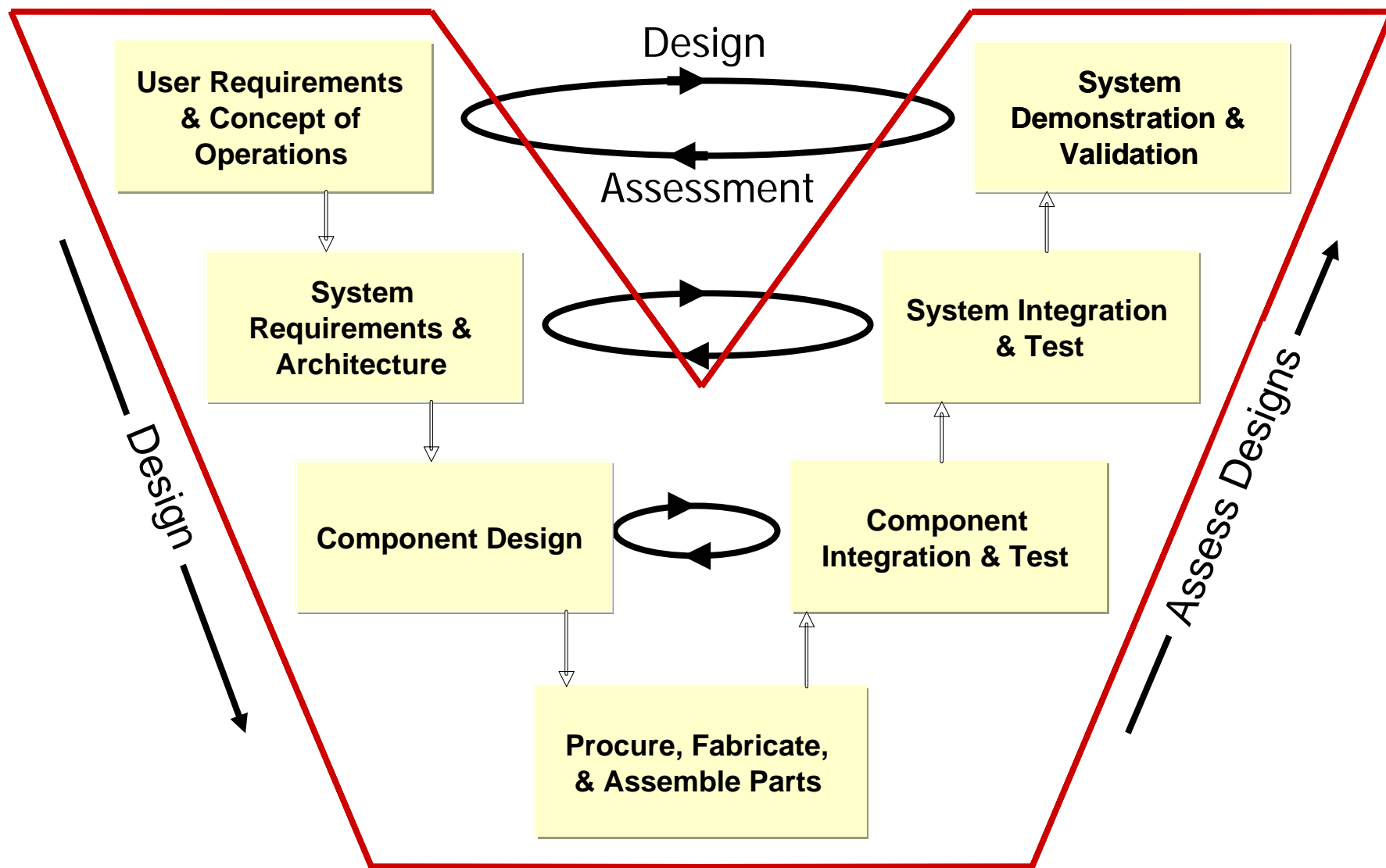DoD Test Week

June 8, 2005

- Imperatives -
of Capabilities-based Acquisition

- To ensure...
  - New systems work in system-of-systems (S-o-S) mission environment, and
  - S-o-S produce the intended mission capability
- Need to change...
  - The traditional focus on individual system engineering
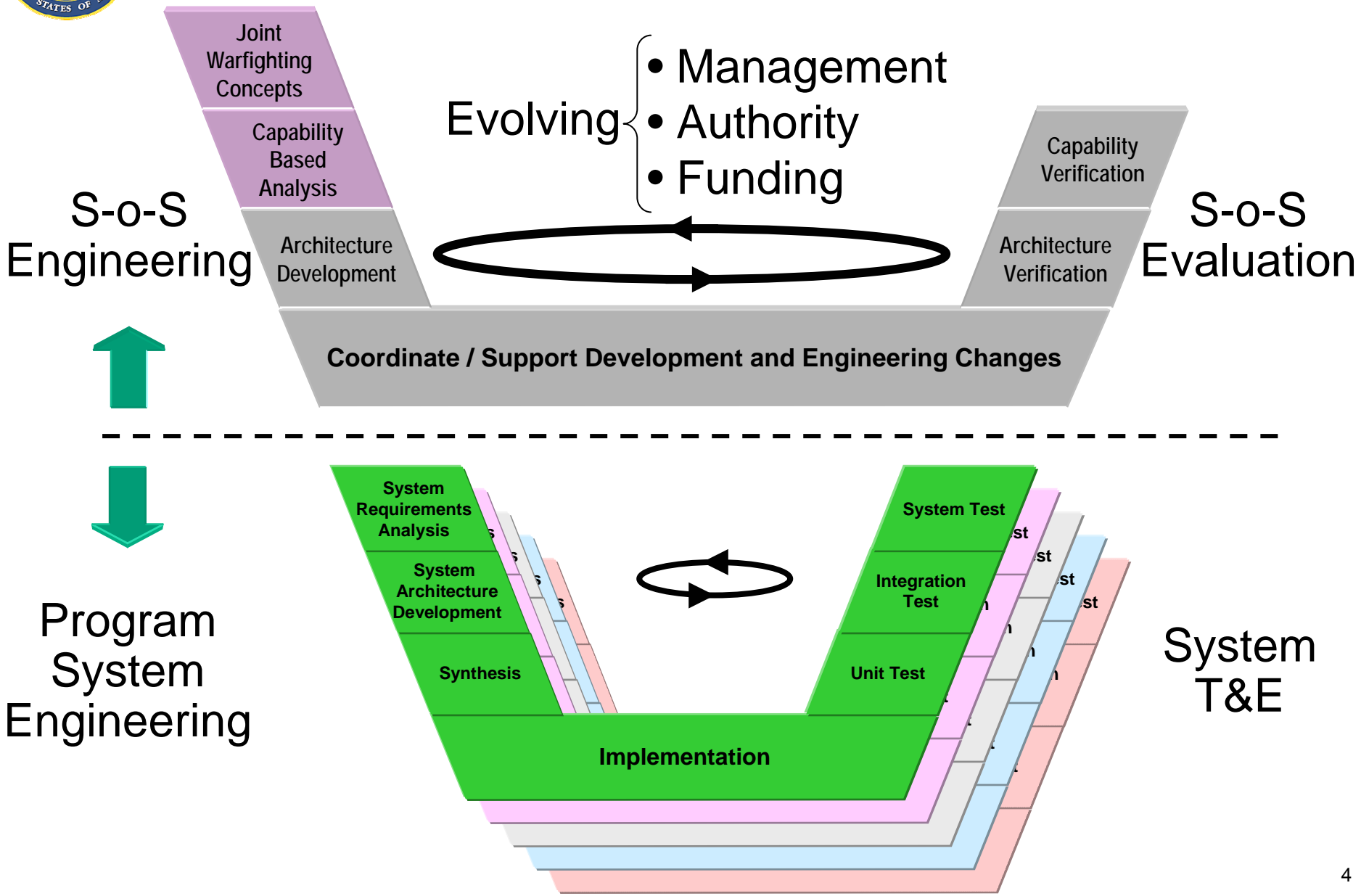 - The traditional focus on individual system T&E

Traditional Systems Engineering

Design

Assessment

User Requirements & Concept of Operations

System Demonstration & Validation

System Requirements & Architecture

System Integration & Test

Component Design

Component Integration & Test

Procure, Fabricate, & Assemble Parts

Design

Assess Designs

S-o-S Systems Engineering

Joint Warfighting Concepts

Capability Based Analysis

Architecture Development

Evolving
- Management
- Authority
- Funding

Capability Verification

Architecture Verification

S-o-S Engineering

S-o-S Evaluation

Coordinate / Support Development and Engineering Changes

Program System Engineering

System Requirements Analysis

System Architecture Development

Synthesis

Implementation

System Test

Integration Test

Unit Test

System T&E

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Why Traditional Systems Engineering and Test Processes Will Not Suffice

- Not adequate for development or evaluation of incremental SoS capabilities
- Range limitations
- Affordability
- Live S-o-S availability
- Complexity
- Shortfalls in M&S capabilities

Capability Needed

- DoD infrastructure for distributed collaborative engineering and test environment enabled by M&S :
    - Enable virtual collaboration among all stakeholders
    - Bring LVC components together to enable systems & S-o-S evaluation :

Systems	HWIL	M & S capabilities
Test ranges	R & D Labs	SMEs
Industry partners	Etc.	

    - Evaluation of a system within the joint mission environment from concept development through sustainment
    - Assess S-o-S capability

- Expect the PM to bring the system-under-test (or s-u-design) to the environment
- Cannot afford for each PM (or Component) to create their own mission environment and unique infrastructure

What Do We Need to Do to Make that Happen?

- Build program strategies that integrate M&S with SE & T&E planning (part of SEP, TEMP)
- Develop method and process for testing in a joint environment
- Create a persistent, common, distributed collaborative engineering environment (infrastructure) :
    - Integrated networks
    - Data sharing, archives
    - System & threat models
    - Natural environments (terrain, etc)
    - Joint mission description / TTPs
    - Etc.

- Robust M&S Capability :
  - Maintain (and funding)
  - Improve sharing & reuse (DoD & Industry)
  - Improve trustworthiness (V V & A)
  - Establish common standards
  - Address proprietary info concerns
  - Establish business model
  - Improve leadership & management
  - Improve policies
  - Improve education & training

What We Have Done
Acquisition M&S Initiative

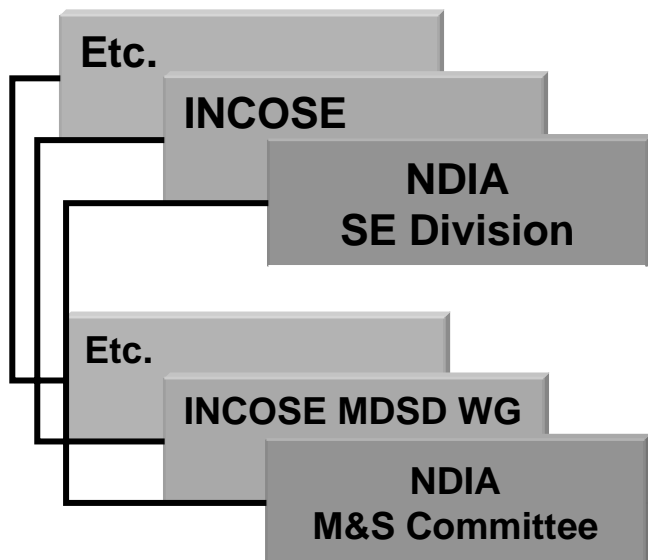To address obstacles to efficient, robust use of M&S in SE and T&E :

1. Lead DoD Acquisition M&S Working Group (AMSWG)
2. Developing <u>Acquisition M&S Master Plan</u> (Dec 05) to address acquisition M&S processes, gaps and required actions
3. Provided Acquisition policy enhancements for M&S planning
4. Building a DAU Continuous Learning Module for PMs and testers (Nov 05)
5. Leading outreach to DoD acquisition & M&S communities, industry and academia

DoD Acquisition M&S Working Grp

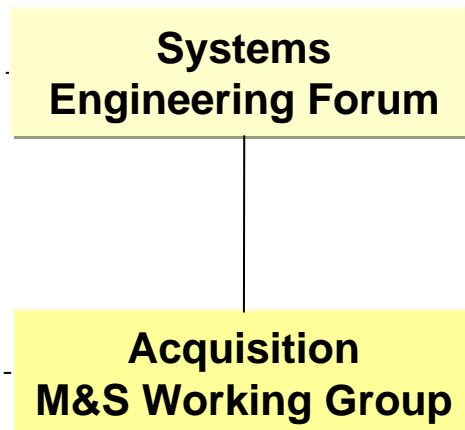Anchored in acquisition community, with ties to industry and M&S

Industry / Academia

Etc.

INCOSE

NDIA SE Division

Etc.

INCOSE MDSD WG

NDIA M&S Committee

DoD SE

Systems Engineering Forum

Acquisition M&S Working Group

DoD M&S

EXCIMS

M&S Working Group

Products

- *NDIA Report "M&S Support to the New DoD Acq. Process"*
- *INCOSE model-driven system design effort*
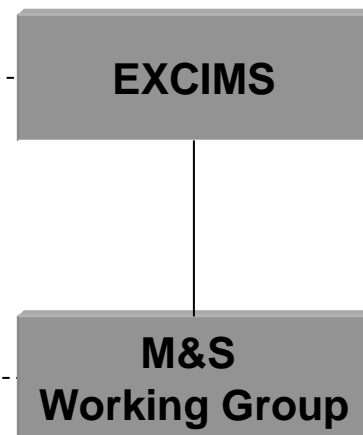- *NDIA open systems workshops on executable architectures*
- *Etc.*

Products

- *Acq. M&S Master Plan*

Members

- *Services*
- *Agencies*
- *OSD*
- *Others*

Products

- *DoD M&S Master Plan*
- *Implementation plans*

What We Have Done
Distributed Collaborative Environment Infrastructure

- Sponsored study " *Joint Distributed Systems Engineering and T&E Strategy* " by Decision Support Center :
  - Examine independent vectors for distributed environments: JDEP, AF-ICE, A-3CE, N-DEP, JSBE, etc
  - Examine available networking options, standards, etc
  - Define needed capabilities and an integrated approach
  - Report results Nov 05
- *DoD Roadmap — Testing in a Joint Environment :*
  - Representing AT&L interests in support of implementation plans (Summer 2005)
  - Vectoring utility to systems engineering, not just test
  - Assisting in steering of JT&E on Joint Test Methodology

Summary

- Changes are required to support capability-based, S-o-S acquisition :
  - New approach to testing balanced with M&S

  - Adapt test methodologies and processes

  - Develop infrastructure capability to enable both SE and T&E in a joint environment

  - Improve our M&S capability

Multiple efforts underway — Much remains to be done